5.3 AND 5.4

1. Find df/dx.

   (a) $f(x) = \left(x^3 + \cos x\right)^2$

   (b) $f(x) = \int_1^{x^3+\cos x} te^t \, dt$

2. Find:

   (a) $\int \left(\frac{e^z}{4} + \frac{1}{1+z^2} - \frac{1}{2}\right) dz$

   (b) $\int_1^2 \frac{1}{z^2} - \frac{2}{z^3} \, dz$

3. The velocity $v(t)$ of an object is given by $v(t) = (t-2)^2 - 1 = t^2 - 4t + 3$ where v is measured in meters per second and t is measured in seconds.

   (a) Find and interpret $v(0)$.

   (b) Find and interpret $\int_0^1 v(t)\,dt$

   (c) Find and interpret $\int v(t)\,dt$

   (d) Now assume you know that when $t = 0$ the object has position $s = 5$ meters. How does this affect your answers to parts (a)-(c) above?

(e) Make a rough sketch of $v(t)$ and illustrate your answer from part (b) above.

(f) Find and interpret $\int_0^3 v(t)\,dt$ and $s(3)$.

(g) Using $\int_0^5 v(t)\,dt = 20/3$, explain where the object is at $t = 5$.

(h) How far did the object travel from $t = 0$ to $t = 5$?